

Social desirability bias in survey measures of illicit work

Rational Choice Sociology: Theory and Empirical Applications

Workshop at Venice International University, San
Servolo

November 28th, 2011

Mark Trappmann

Ivar Krumpal

Antje Kirchner

Ben Jann

Motivation: Estimation of structure of illicit work...

- Indirect Methods (Macro Approaches)

 - National Accounting Approaches (employment gap methods, income gap methods)

 - Monetary Approaches (transaction approach, currency demand approach)

 - Physical Input Approach (electricity consumption method)

 - Hidden Variable Approach (model-based, i.e. LISREL)

- Direct Methods (Micro Approaches)

 - Tax Auditing & Compliance Methods

 - declared and actual income

 - Survey Data

 - black activities, tax evasion, tax morale

 - Administrative Data

 - Official Number of People found Guilty (Financial Control Department for Illicit Work (FKS))

Measurement in Surveys: What has been done?

Application of various approaches in surveys, e.g.:

- the “Casual Approach”, “Everybody Approach” or the “Other People Approach” forgiving wording, asking about long periods/distant past, loading of questions, paraphrasing,
- Mode change: self-administration methods

(Bradburn et al., 2004)

Variation of estimates in surveys:

Source	Filter (y/n)	Hours per week	N	Earnings per hour	N
Feld and Larsen 2006 (2008: 2)	y	7.3	46	9.2	94
	n	0.31	1.083	0.80	1.083
Eurobarometer 2007 (European Commission, 2007: 96)	y	12.5	39	12.0	27
	n	0.22	1.510	0.21	1.510

no use of de jeopardizing techniques to inquire structure of illicit work (esp. in CATI mode)

-> Recommendation to “consider alternatives to standard questions [...]”.

(Bradburn et al., 2004: 81; cf. also Boockmann et al., 2010: 100)

Advancing ... the Item Count Technique (ICT)

(Droitcour 1991)

Group A (Long List)	Group B (Short List)
Did you ever keep a book of household accounts? Does your household contain more TV's than members? Do you own a mobile phone? Did you carry out any illicit work for a private individual this year [2010]?	Did you ever keep a book of household accounts? Does your household contain more TV's than members? Do you own a mobile phone?
How many items apply to you (<i>were answered with ,YES'?</i>)?	

Respondent receives **a list of items** and is asked to answer how many of these binary items apply (i.e. how many yeses), but **not which ones!** Estimated prevalence of illicit work = difference between subsample means

Empirical evidence regarding the ICT

- positive evidence:
 - ICT outperforming DQ (Dalton et al., 1994; Wimbush and Dalton, 1997; LaBrie and Earleywine, 2000; Rayburn et al., 2003; Tsuchiya et al., 2007; Holbrook and Krosnick, 2010; Coutts and Jann 2011)
 - mixed evidence:
 - ICT not outperforming DQ (Ahart and Sackett, 2004; Tourangeau and Yan, 2007)
 - Comparison of direct questioning (DQ) with the novel approach to ask quantitative sensitive questions, namely the
 - ... Item Sum Technique (IST)
- regarding hours spent in and earnings from illicit work (CATI).

Hypotheses

- We hypothesize that $IST > DQ$
the IST will yield higher estimates compared to direct questioning ('more-is-better assumption')
-> anonymity of respondent answer, simple instructions, easy comprehension for respondents and easy to administer, since no randomization device necessary.

Project Outline

- Cooperation of IAB, University of Leipzig, University of Bern
 - Implemented as follow-up questions in the framework of an RRT-study,
 - questionnaire covering items on employment, predictors of illicit work (opportunity structures, attitudes and norms, networks, perceived costs and benefits) and demographics,
 - experience with asking sensitive questions on the telephone (Krumpal 2010)
- Implementation as **split-ballot experiment** using direct questioning as control.
- Two random samples (n=3.211)
 - **register sample of employed persons** (18-70) and **register sample of basic income support recipients** (18-64) in Germany (fieldwork: ForschungsWerk); RR1: 17.5 %

Definition of Illicit Work

- With ‚illicit work‘ we refer to all labor, that produces an income, however, is concealed from the authorities, e.g. in order to avoid paying taxes or social security contributions.
- Criminal activities, such as the production of drugs and drug dealing do however NOT count as illicit work.

Implementation of the IST: Single-List Design

(cf. ICT Droitcour 1991)

Group A (Long List)

C1: How many hours did you watch TV last week?

S1: How many hours do you usually work illicitly per week?

Please sum up the answer to both questions, please, do not report individual answers.

Group A (Long List)

C2: How high are your monthly costs for your apartment respectively your house?

S2: How high are your usual earnings per month working illicitly?

Please sum up the answer to both questions, please do not report individual answers.

Preceded by brief definitions of illicit work and instructions regarding the technique if in treatment group. Also questions regarding the prevalence by means of DQ resp. RRT.

Group B (Short List)

C1: How many hours did you watch TV last week?

Group B (Short List)

C2: How high are your monthly costs for your apartment respectively your house?

Number of cases assigned to treatments

	Employed	Benefit Recipients	Overall sample	Item Nonresponse Hours	Income
DQ	565	580	1.145	3	6
IST					
Short List	496	460	956	2	44
Long List	459	377	836	2	26
DQ					
RRT ref	93	181	274	0	0
Overall sample	1.613	1.598	3.211	7	76

Estimators IST I – Univariate Estimates

- Again, let S be the sensitive item of interest and C be the non-sensitive control item. Observed is:

$$Y_i = \begin{cases} S_i + C_i & \text{if } i \text{ belongs to Group A (Long List)} \\ C_i & \text{if } i \text{ belongs to Group B (Short List)} \end{cases}$$

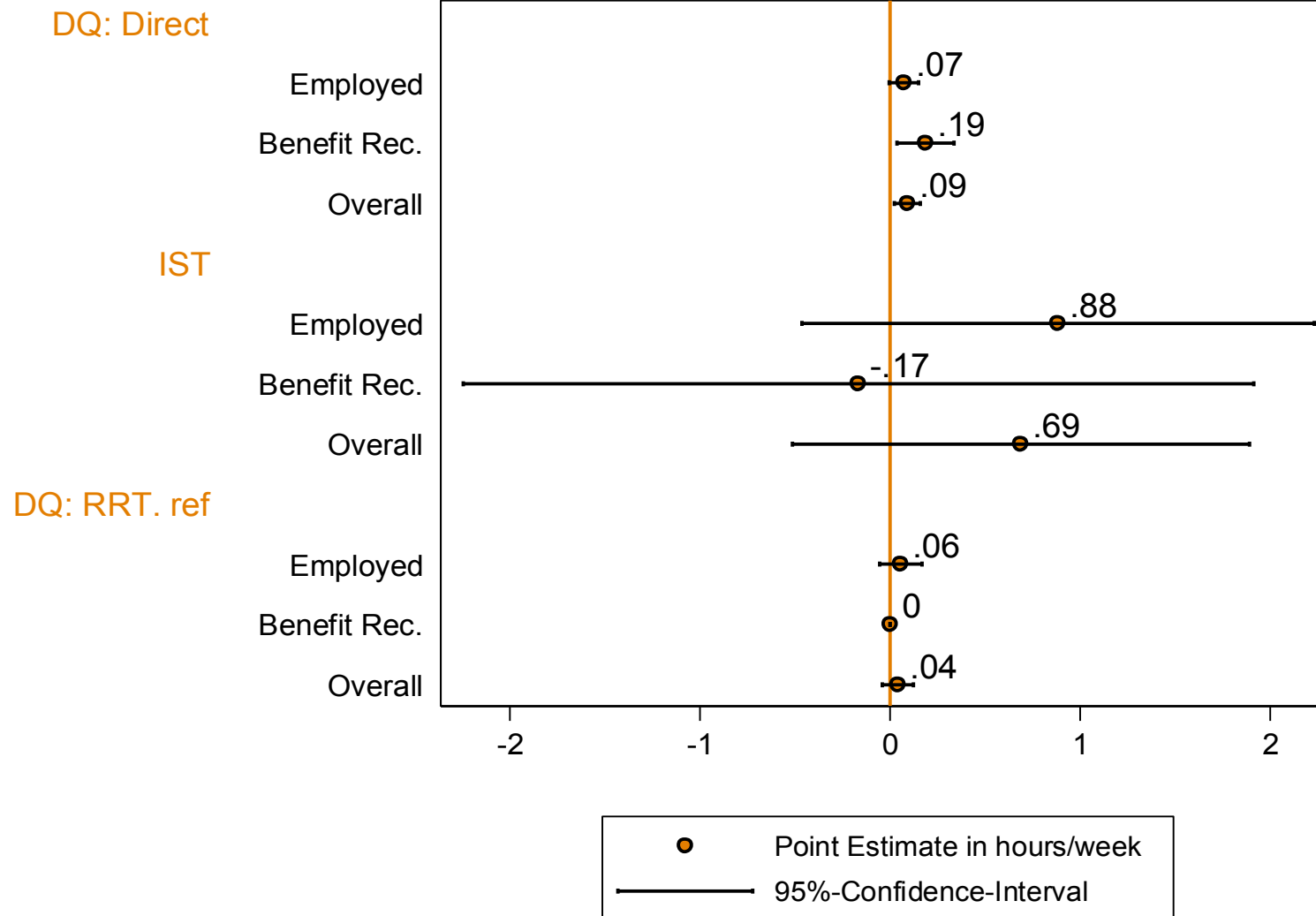
- The mean difference of Y between the two groups is an unbiased estimate of the population mean of S :

$$\bar{S} = \bar{Y}^A - \bar{Y}^B = \frac{1}{N^A} \sum_{i \in A} Y_i - \frac{1}{N^B} \sum_{i \in B} Y_i$$

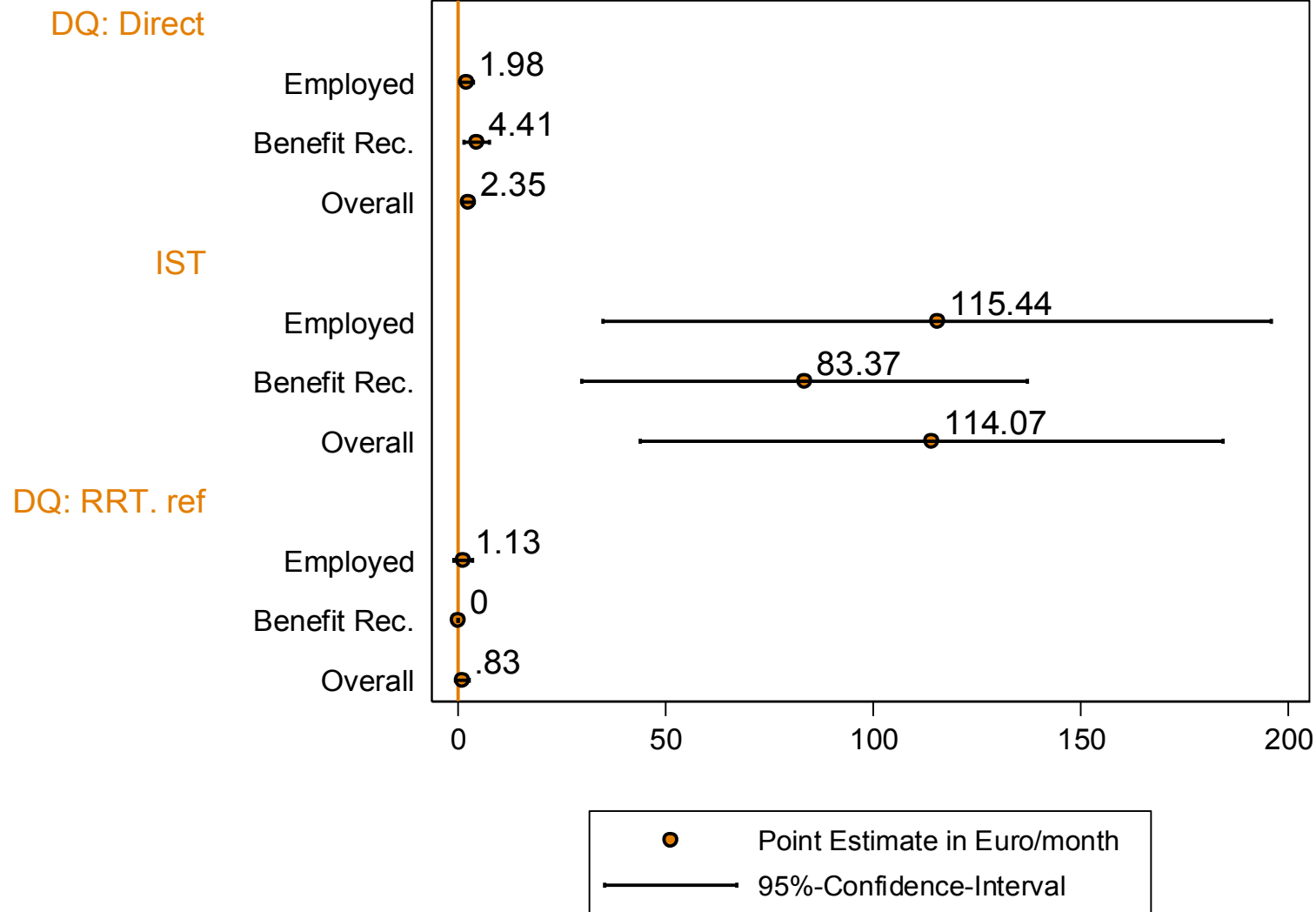
- The sampling variance of the mean estimate of S can be derived as:

$$\hat{V}(\bar{S}) = \hat{V}(\bar{Y}^A) + \hat{V}(\bar{Y}^B) = \frac{1}{N^A(N^A - 1)} \sum_{i \in A} (Y_i - \bar{Y}^A)^2 - \frac{1}{N^B(N^B - 1)} \sum_{i \in B} (Y_i - \bar{Y}^B)^2$$

Univariate Estimates: Hours per Week



Univariate Estimates: Earnings per Month



Estimators IST II – Multivariate Models

- Let $T_i = \begin{cases} 1 & \text{if } i \in A \\ 0 & \text{if } i \in B \end{cases}$ so that $Y_i = T_i S_i + C_i$
- Suppose that S and C both depend linearly on a vector of covariates X (including a constant), then we can model Y as

$$Y_i = T_i(X_i'\beta + v_i) + (X_i'\gamma + v_i) = T_i X_i'\beta + X_i'\gamma + \varepsilon_i \quad \text{with } E(v_i) = E(v_i) = E(\varepsilon_i) = 0$$

- An estimate of parameter vector β can be obtained by least squares regression or, assuming bivariate normally distributed errors, by maximizing the log likelihood

$$\ln L = \sum_{i=1}^N T_i \ln \left[\frac{1}{\sqrt{\sigma_v^2 + \sigma_v^2 + 2\rho\sigma_v\sigma_v}} \phi \left(\frac{Y_i - X_i'\beta - X_i'\gamma}{\sqrt{\sigma_v^2 + \sigma_v^2 + 2\rho\sigma_v\sigma_v}} \right) \right] + (1 - T_i) \ln \left[\frac{1}{\sigma_v} \phi \left(\frac{Y_i - X_i'\gamma}{\sigma_v} \right) \right]$$

where $\phi()$ is the standard normal density and ρ is the error correlation.

Multivariate Models: Earnings from Illicit Work

- **Expected Utility:**

benefits: marginal tax/benefit withdrawal rate, preferred working hours
perceived risk (risk of detection x severity of punishment)

costs:

- **Opportunity structure:**

qualification, occupation, network resources

- **Norms:**

prevalence of illicit work among one's network, attitudes towards illicit work

- **Demographic Variable:**

gender, age, region

Multivariate Models: Selected Results

Gender: (ref. male)	Female	146.42** (52.47)
Qualification: (ref. voc. training)	None	142.19+ (74.21)
	tertiary degree	-117.51 (73.09)
Labor income: (ref. 0-800 Euro)	801-3.499	137.92+ (71.10)
	>= 3.500 Euro	302.82** (104.87)
Norms against illicit work (ref. medium)	Low	98.24 + (57.08)
	High	110.40 + (60.55)
Network size (help find job) (ref. 0-2)	3-9	-87.02 + (60.55)
	10+	115.90 + (60.02)
...	
Constant		-42.62
Wald chi2 (22)		40.28**
N		1.722

Findings, Limitations & Future Work

- Generalizing the item count technique we have presented a new privacy preserving technique for metric sensitive items and applied it in a study on illicit work
- We have derived point estimators and regression estimators for IST variables
- Results indicate that IST can be fruitful in yielding higher estimates of the socially undesirable behaviour than direct questioning (2 out of 4)
- Limitations and future improvements
 - Differential item nonresponse between treatment conditions contaminates randomization
 - Large standard errors of point estimates and regression coefficients: Trade-off with privacy preservation
 - Strong assumptions required: measurement of insensitive item independent of technique, no variable omitted that influences C and S
 - Modelling issues:
 - natural lower bound of 0 for individual values of S not accounted for (double hurdle models)
 - no transformation of dependent variable allowed

References

- Ahart, A.M. & Sackett, P.R. (2004): "A New Method of Examining Relationships Between Individual Difference Measures and Sensitive Behavior Criteria: Evaluating the Unmatched Count Technique." *Organizational Research Methods* 7(1):101-114.
- Boockmann, B.; Döhrn, R.; Groneck, M. & Verbeek, H. (2010): "Abschätzung des Ausmaßes der Schwarzarbeit." Institut für Angewandte Wirtschaftsforschung e.V. (IAW) und Rheinisch-Westfälisches Institut für Wirtschaftsforschung e.V. (RWI).
- Bradburn, N.; Sudman, S. & B. Wansink (2004): *Asking Questions*. Revised Edition. San Francisco: Jossey-Bass.
- Coutts, E. & Jann, B. (2011): "Sensitive Questions in Online Surveys: Experimental Results for the Randomized Response Technique (RRT) and the Unmatched Count Technique (UCT)." *Sociological Methods and Research* 40:169-193.
- Dalton, D.R.; Wimbush, J.C. & Daily, C.M. (1994): "Using the Unmatched Count Technique (UCT) to Estimate Base Rates for Sensitive Behavior." *Personnel Psychology* 47:817-828.
- Droitcour, J.; Caspar, R.A.; Hubbard, M.L.; Parsley, T.L.; Visscher, W. & Ezzati, T.M. (1991): "The item count technique as a method of indirect questioning: A review of its development and a case study application." In *Measurement errors in surveys*, eds. P.P. Biemer, R.M. Groves, L.E. Lyberg, N.A. Mathiowetz, und S. Sudman, 185-210. Wiley.
- European Commission (2007): "Undeclared Work in the European Union." Report. Special Eurobarometer 284 Wave 67.3.
- Feld, L.P. & C. Larsen (2008): "'Black' Activities Low in Germany 2006." *News from the Rockwool Foundation* Research Unit, Copenhagen.

References

- Holbrook, A.L. & Krosnick, J.A. (2010): "Social Desirability Bias in Voter Turnout Reports. Tests Using the Item Count Technique." *Public Opinion Quarterly* 74(1):37-67.
- Jann, B. (2011): "isnreg: Stata module to estimate a regression for item sum data." Unpublished.
- Krumpal, I. (2010): *Sensitive Questions and Measurement Error: Using the Randomized Response Technique to Reduce Social Desirability Bias in CATI Surveys*. Dissertation, Fakultät für Sozialwissenschaften und Philosophie, Universität Leipzig.
- LaBrie, J. W., and M. Earleywine. 2000. "Sexual risk behaviors and alcohol: Higher base rates revealed using the unmatched-count technique." *Journal of Sex Research* 37: 321-326.
- Rayburn, N. R., M. Earleywine, and G. C. Davison. 2003. "Base rates of hate crime victimization among college students." *Journal of Interpersonal Violence* 18: 1209-1221.
- Schneider, F. & Enste, D.H. (2000): "Shadow Economies: Size, Causes, and Consequences." *Journal of Economic Literature* 38(1) :77-114 .
- Tourangeau, R.; Yan, T. (2007): "Sensitive questions in surveys." *Psychological Bulletin* 133:859-883.
- Tsuchiya, T.; Hirai, Y. & Ono, S. (2007): "A Study of the Properties of the Item Count Technique." *Public Opinion Quarterly* 71(2):253-272.
- Wimbush, J.C., and D.R. Dalton. 1997. "Base rate for employee theft: Convergence of multiple methods." *Journal of Applied Psychology* 82: 756-763.

Introduction: Illicit Work

A TAXONOMY OF UNDERGROUND ECONOMIC ACTIVITIES

	Monetary Transactions		Nonmonetary Transactions	
Illegal Activities	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling and fraud.		Barter: drugs, stolen goods, smuggling, etc. Produce or growing drugs for own use. Theft for own use.	
Legal Activities	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

Source: Rolf Mirus and Roger S. Smith (1997, p. 5), with additional remarks.

(Schneider, F./Enste, D. 2000: 79)

Structure of Illicit Work

Sup. / Dem.	Individual/Household	Enterprise
Individual/ Household	Cleaning, Babysitting, Garden Work, repairs	envelope wages, undeclared jobs in gastronomy, construction
Enterprise	Building repairs, caretaking, car repair, etc. that are provided without invoice	Sub-contractors (e.g. construction)

Univariate Estimates: Hours per Week

	Employed	Benefit Recipients	Overall sample	N
DQ S: i.w.	0.07° (0.04)	0.19* (0.08)	0.09* (0.04)	1.142
IST S: i.w.	0.88 (0.69)	-0.17 (1.06)	0.69 (0.61)	1.788
C: TV	11.33*** (0.44)	15.29*** (0.70)	11.89*** (0.39)	
DQ RRT ref	0.06 (0.06)	0.00 (0.00)	0.04 (0.04)	274

Standard errors in parentheses; significant at levels: ° $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$; selection weights applied ; S = hours of illicit work per week (item included in long list only); C = hours watched TV last week (item included in both short and long list)

Univariate Estimates: Hours per Week

	Employed	Benefit Recipients	Overall sample	N
DQ S: i.w.	0.07° 0.04	0.19* 0.08	0.09* 0.04	1.142
IST S: i.w.	0.88 0.69	-0.17 1.06	0.69 0.61	1.788
C: TV	11.33*** 0.44	15.29*** 0.70	11.89*** 0.39	
DQ RRT ref	0.06 0.06	0.00 0.00	0.04 0.04	274

Standard errors in parentheses; significant at levels: ° $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$; selection weights applied ; S = hours of illicit work per week (item included in long list only); C = hours watched TV last week (item included in both short and long list)

Univariate Estimates: Earnings per Month

	Employed	Benefit Recipients	Overall sample	N
DQ S: i.w.	1.98* (0.82)	4.41** (1.52)	2.35** (0.73)	1.139
IST S: i.w.	115.44** (41.11)	83.37** (27.39)	114.07** (35.89)	1.722
C housing	698.00*** (20.07)	512.65*** (10.99)	671.11*** (17.30)	
DQ RRT ref	1.13 (1.13)	0.00 (0.00)	0.83 (0.83)	274

Standard errors in parentheses; significant at levels: ° $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$; selection weights applied ; S = income per month from illicit work (item included in long list only); C = monthly costs for housing (item included in both short and long list)